REMR TECHNICAL NOTE CS-ES-2.3

METHODS OF AUTOMATING THE COLLECTION OF INSTRUMENTATION DATA

PURPOSE: To identify a source of information on available methods and equipment to help automate the collection of instrumentation data at Corps of Engineers' hydraulic structures.

REFERENCES:

a. Instrumentation automation for concrete structures; instrumentation automation techniques. WYLE Laboratories, Hampton, VA. Prepared for US Army Engineer Waterways Experiment Station, Vicksburg, MS. Technical Report REMR-CS-5, Report 1.

b. Instrumentation automation for concrete structures; automation hardware and retrofitting techniques. WYLE Laboratories, Hampton, VA. Prepared for US Army Engineer Waterways Experiment Station, Vicksburg, MS. Technical Report REMR-CS-5, Report 2.

c. Instrumentation automation for concrete structures; available data collection and reduction software. WYLE Laboratories, Hampton, VA. Prepared for US Army Engineer Waterways Experiment Station, Vicksburg, MS. Technical Report REMR-CS-5, Report 3.

APPLICATION: These reports form a set which is designed to provide the user with procedures and techniques for automating structural safety related instruments and reducing the data these instruments collect. They can assist the user in the areas of system design, component selection, system installation, and maintenance of the large body of instrumentation hardware and software that is currently available.

ADVANTAGES: These methods and techniques allow the collection and reduction of safety related data in a more timely manner than is possible when collected and reduced by hand. Data can be collected more consistently, greater numbers of surveys are possible, and data reduction backlogs are improved because tedious tasks can be detailed to machines.

LIMITATIONS: Adoption of automated methods of collecting instrumentation data requires an initial capital investment, and an increased awareness of the maintenance requirements of electronic equipment.

AVAILABILITY: Copies of the above-cited reports are available from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

BACKGROUND AND DESCRIPTION: Collection of instrumentation data at Corps hydraulic structures plays an integral role in ensuring the continued safe performance of these structures. The range of instruments used in this effort is described in Engineer Manual 1110-2-4300, "Instrumentation for Concrete Structures." The amount of data collected is sometimes massive, requiring periodic reading of between 1500 and 2000 instruments. As Corps hydraulic structures become older, these data need to be observed more frequently to keep ahead of potential problems. The manpower effort to accomplish this task is high and is taxed even more strongly when extreme conditions such as high water require that the instruments be read on a more frequent schedule.

These conditions can be alleviated and quality data can continue to be collected and reported in a timely manner by automating the collection and reduction process. This will allow engineers and technicians greater opportunities to analyze the data that have been collected rather than spend their valuable time collecting the data.

The three reports comprising Technical Report REMR-CS-5 provide detailed information on automation systems and allow comparisons of the technical information available on instruments used to accomplish the automation task.

a. Report 1 gives a comprehensive review of the steps and components that are required to design and put together a competent automation system. Topics which are covered include: components of a design requirements document, system design considerations, characteristics of sensors which can be automated, signal conditioning and processing requirements, data transmission, and reduction techniques. The engineering technician is addressed in this report by providing guidance on system installation considerations, system checkout procedures, and maintenance philosophies.

b. Report 2 is divided into two sections. The first section gives solutions to retrofitting existing instruments which may already be installed at Corps structures so that they may function as automated instruments. The second section provides technical data on instruments and computer hardware that are necessary to make choices for the correct components to fit a particular automation design. An extensive search of the available pool of instruments and computers was made, and an unbiased review of their technical capabilities is presented.

c. Report 3 is similar to section 2 of Report 2, except that its subject matter is the available software that can be used to drive the automated instruments and reduce and report the collected data.

All three reports are designed to be used together to understand the process of automation and have in one location a source of information on the components needed to accomplish the automation process.

ADDITIONAL REFERENCES:

a. Instrumentation for concrete structures. US Army Corps of Engineers, Washington, DC, Sep 1980. Engineer Manual 1110-2-4300.

b. Instrumentation fundamentals and applications. R. Morrison. John Wiley, New York, 1984.

c. Electronic instrumentation fundamentals. A. P. Malvinom. McGraw-Hill, New York, 1967.

d. Electronic measurements and instrumentation. B. M. Oliver, J. M. Cage. McGraw-Hill, New York, 1971.

e. Measurement systems: application and design. E. O. Doeblin. McGraw-Hill, New York, 1966.

f. Electronic instrumentation and measurement techniques. W. D. Cooper. Prentice-Hall, Englewood Cliff, NJ, 1970.